

# Health Information Technology for Improving Quality of Care in Primary Care Settings

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**HEALTH IT**

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## Introduction

Health information technology (Health IT) has the potential to enable better care for patients, and to help clinicians achieve continual improvements in the quality of care in primary care settings. However, simply implementing current health IT tools will not bring about these results. To generate substantial and ongoing improvements in care, health IT adoption must go hand in hand with the implementation of a robust care model and the routine use of solid improvement methods by clinicians and other staff.

At the request of the Agency for Healthcare Research and Quality (AHRQ) and their subcontractor, the National Opinion Research Center (NORC), a team from the Institute for Healthcare Improvement examined the link between health information technology and quality improvement in a range of primary care settings. Based on our review, we see primary care practitioners contending with significant dilemmas as they move toward health IT adoption:

- Industry leaders are pushing for health IT as the solution to quality and cost issues, but successful examples are few and inconsistent.
- Many clinicians are strongly drawn to health IT as a mechanism for improving quality of care, but they cannot fully articulate what they need and therefore are left to sort through the varying and often contradictory statements of industry leaders, experienced colleagues, and vendors.
- Unfortunately, many clinicians assume that existing health IT systems will include the improvement tools they need, but discover in fact that important tools are not available, or are awkward and sometimes very expensive to use.

Many who advocate the expanded use of health IT appear to believe that health IT itself will catalyze improvements in care. While there may be a few narrow instances where this is the case, we believe that most current health IT systems have a long way to go before they encompass the functionality that would support robust ongoing improvement of care. Additionally, the success of health IT-enabled improvement depends critically on the skills of clinical and administrative staff in primary care settings to understand and use solid improvement methods—methods that need not rely solely on health IT to be effective.

The intent of this document is to propose frameworks and specific, testable changes that could help primary care clinicians and administrators, as well as policymakers and vendors, accelerate progress toward fulfilling the promise of health IT for health care quality.

## Background of the Project

The U.S. Department of Health and Human Services articulates the following vision for health IT and quality:<sup>1</sup>

Health information technology (Health IT) allows for comprehensive management of medical information and its secure exchange between health care consumers and providers. Broad use of health IT will:

- Improve health care quality.
- Prevent medical errors.
- Reduce health care costs.
- Increase administrative efficiencies.
- Decrease paperwork.
- Expand access to affordable care.

As part of the national strategy to bring health care into the 21<sup>st</sup> century, the AHRQ has awarded grants and contracts to support the use of health information technology to dozens of recipient organizations in 41 states. The goals of AHRQ's health IT initiative<sup>2</sup> are to:

- Help clinicians develop higher-quality, safer health care.
- Put the patient more squarely at the center of health care.
- Stimulate planning and implementation of health IT, especially in rural and underserved areas.
- Identify the most successful approaches, as well as barriers, to implementation.
- Make the business case for health IT by evaluating costs and benefits.

In addition to the Federal strategy and supporting activities, professional associations such as the American Academy of Family Physicians, the American College of Physicians, the American Medical Association, the American Medical Informatics Association, the Certification Commission for Healthcare Information Technology, the College of Healthcare Information Management Executives, the Healthcare Information and Management Systems Society are actively engaged in bringing the potential of health IT to fruition.

### **Aims of the Project**

At the request of AHRQ and NORC, its subcontractor, the Institute for Healthcare Improvement agreed to work with AHRQ and NORC to develop a framework by which health information technology could catalyze improvement in the quality of care in primary care settings in the United States. Further information about the scope and activities of the project is provided in Appendix A.

The intent of this project was to distill the best of what is currently known about using health IT for quality improvement in primary care settings, and to shape a set of change concepts<sup>3</sup> that could be broadly disseminated in order to accelerate the adoption of health IT for improvement. The specific aims were to:

- Identify health IT functionality that will support improvements in primary care focused on individual patients and groups of patients;
- Identify "change ideas" for implementing health IT as an improvement tool in a range of primary care settings;
- For known, effective changes, propose strategies for spreading health IT to large numbers of primary care practices; and
- Identify promising change ideas ready for further development and prototyping.

While the project team interviewed staff from many diverse primary care settings, visited several practices, and convened an expert meeting attended by a group of recognized industry leaders and clinicians committed to using health IT, this project was not designed as a comprehensive survey of all health IT activity under way, even among AHRQ grant and contract recipients. Rather, it was an attempt to make it easier for primary care clinicians and administrative staff to think about the implications of health IT for quality improvement, and make more educated and more successful choices when they proceed to adopt health IT.

## **Relationship of Health IT to Improvement**

Through the interviews and site visits carried out as part of this project, a complex picture emerged of the current state of health IT use in primary care practices. The practices we interviewed or visited were clearly committed to adopting health IT and were typically seeking improvements in the way their business operated, in how key processes such as documentation were handled, and in the quality of patient care. All are legitimate areas of improvement, but often are not distinguished from one another, perhaps because the field of health information technology is fairly young and lacks a standard nomenclature related to improvement.

To help synthesize the many ways health IT was described to us, we propose thinking about three broad domains where information technology is being, or could be, applied to accomplish improvements: Billing and Administration, Documentation, and Patient Care.

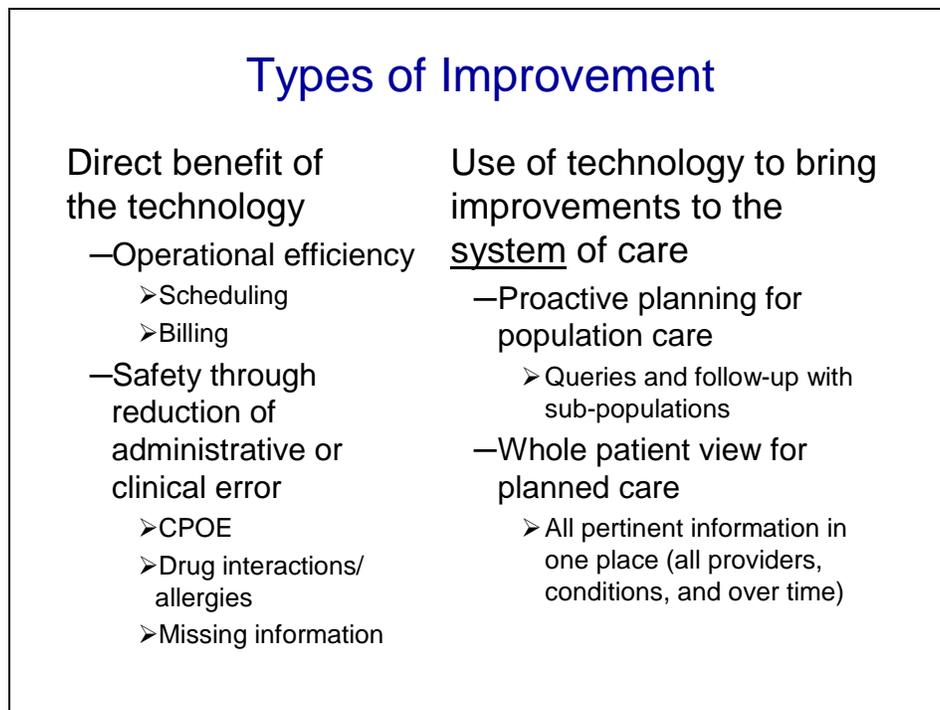
**Billing and administrative.** These domain functions are likely to be the most mature for several reasons: the underlying processes have been quite defined prior to automation; health care business processes resemble similar processes in other industries that are well understood; the efficiency benefits are relatively easy to document; and health care payers and suppliers to health care organizations are providing encouragement to move toward electronically managed processes.

Our observation was that most primary care practices started their use of information technology in this area. In addition, some of the experts convened in the course of the project stated that truly improving the process of patient care would be impossible without first improving the billing and administrative functions of the practice. The quandary of the primary care clinician working at top speed in a broken system just to keep from falling behind was eloquently expressed by many.

**Electronic documentation.** This domain is less mature and is the predominant focus of many current health IT efforts. Enabling the development of effective electronic medical records (EMRs) are the familiarity of paper records, as well as widely shared traditions of creating, using, saving, and retrieving paper records. These provide at least a scaffold for defining a set of enhanced functions made available through electronic technology. In the sites we studied, many identified this area as their primary focus currently, and we heard a number of success stories about implementation of EMRs, especially among networks of clinics or independent physician organizations.

**Patient Care.** Relatively few sites were able to describe a use of technology that was designed to continuously improve the overall system of care, as contrasted to operational or documentation improvements that might reduce certain kinds of errors and waste. Those who described established practices for using health IT to improve the system of care often cited registries as being critical tools and in some cases were skeptical of EMRs, or would prefer that EMRs follow and build upon registries, rather than the reverse.

Through learning from and observing the organizations that participated in this project, we developed a hypothesis that primary care practices were addressing two distinct types of improvement—one attainable directly through applying technology to improve operational processes and documentation, and the other attainable only through systems that permit continuous, ongoing improvement of a system of care. We have summarized the two foci of improvement below:



While direct benefits of technology may be more familiar to clinicians and industry leaders, and may be the logical place to start for most practices, we believe that, once implemented, the benefits will soon plateau. Technology-enabled improvements *in the system of care*, however, offer recurring benefits and the potential for long-term, continual gains in efficiency and quality of patient care.

Although our focus in this report is on technology-enabled *system improvements*, in practical terms, achieving initial efficiency benefits from the technology may be a crucial step for primary care practices. For many primary care professionals, improving the efficiency of their practices may be the only way they can relieve the pressure of daily demands so that they are able to turn their attention to broader-scale, systemic improvements in care.

## Health IT Focused on Improving Patient Care

The principal result of the project was an expanded set of ideas about how health IT could support fundamental improvements in care, beyond those that would accrue if currently understood errors and waste could be removed. The knowledgeable individuals who participated in the expert meeting validated the preliminary formulation of this idea and added greatly to its robustness.

We propose a view of health IT focusing on its role in supporting *ongoing improvements to the quality of patient care as a fundamental property of the health care system*. Many efforts to harness health IT to health care improvement focus on promoting safety, reducing errors, providing clinical decision support, and improving continuity of care. All of these clearly contribute to the quality of patient care. And yet they fail to describe the full scope of the opportunity to use health IT to advance health care quality.

If we imagined a system of care where no known safety lapses ever occurred, where there were no errors, where relevant clinical decision support was reliably and conveniently available, and where patient data were accessible seamlessly throughout the system, we could still identify major opportunities for improvement. Some examples might be:

- Providing care and information specifically tailored to the needs, preferences, and medical challenges of each individual.
- Applying prevention strategies for individuals and populations.
- Providing care in ways that are easier to access.
- Proactively reaching out to patients whose condition may not be responding to standard approaches.
- Eliminating wasted effort and material from the health care system.
- Partnering fully with patients and families or caregivers.

One way of encapsulating this vision of a health care system is the so-called “Care Model” developed by the team at the MacColl Institute for Healthcare Innovation (<http://www.centerforhealthstudies.org/research/maccoll.html>) and its well-known program, Improving Chronic Illness Care (<http://www.improvingchroniccare.org/>). Originally developed to provide a framework for chronic care, it has been broadened and generalized to look at the overall framework of care, and is especially helpful when considering the design of primary care. The purpose of this document is not to provide a detailed explication of the care model, (more information can be found at the links above and at: <http://www.ihl.org/IHI/Topics/PatientCenteredCare/SelfManagementSupport/EmergingContent/System+ChangeModelChronicCareModel.htm> ), but rather to suggest that a thoughtfully described model of care can be very helpful as a starting point for thinking about using health IT for improvement.

Recognizing that there are many kinds of improvements, we focused our attention on the *use of technology to bring about improvements to the **system** of care*, allowing it to reliably deliver quality services as defined by the Institute of Medicine.<sup>4</sup> This focus leads us to emphasize two priorities:

1. Proactive planning for population care
2. Planned care for the individual patient as a “whole”

Because we also view improvement as an ongoing process, we were attentive to how useful health IT systems were in supporting the continual process of improving care.

## **Health IT Functionality for Improving Quality of Patient Care**

In formulating and describing some ideas about health IT functionality for improving quality of care, we are greatly indebted to the organizations that participated in this project, and especially to the expert meeting participants. The framework described was strongly supported by the participants; the specific details are not consensus outputs, but were greatly enhanced and strengthened by the work of the expert meeting participants.

In describing ideas about health IT functionality for improving the quality of patient care, we start with the needs of patients, both individual patients, and populations, or groups, of patients.

A useful health IT system would provide comprehensive support to clinicians addressing an individual patient’s current health status or health concerns, as well as their entire span of health care needs both today and over time.

Similarly, health IT can help clinicians improve the care they provide to whole groups of patients by providing an expanded view of health management of more than one patient at a time. This concept and the methodology to support its activation are less familiar to many clinicians, because it is practically impossible to accomplish in a paper-based system. However, just having an electronic system does not insure that population management functionality will be available. Ideally, health IT will support the work of primary care providers related both to individual patients and to groups of patients, both at a single point in time and over the course of time.

We propose describing health IT functionality for improvement, focusing on the specific functionalities for Population (Proactive) Care, Whole Patient (Planned) Care, and Measurement. Each area is followed by a list of “quality characteristics” that should help the reader to understand, recognize, and evaluate the functionalities in an existing health IT system. Additionally, these characteristics should help an organization create a common understanding of their own health IT needs.

### **Population (Proactive) Care**

To provide effective care for populations, data are used to answer questions and provide insights into the health status of groups of patients so that their care can be improved, consistent with evidence-based recommendations. Key functionality focuses on having flexible, powerful, yet easy-to-use tools for querying databases.

In this report we use the following terminology. A “query” is a question asked of the database that results in a list of patients who meet the criteria. A “filter” denotes specific criteria for a data field or item that is defined in the query. In other words, if the user wants to run a query on

the database that lists all patients who have diabetes and red hair, the query would contain two filters, one for the diagnosis of diabetes and one for the color of hair.

Two major types of queries are important to focusing on population-related issues. The first defines a sub-population of interest. This may be a whole panel of patients or, more broadly, all patients served by an organization or a group of organizations. Typically, the initial query will be aimed at a specific sub-population, such as all patients with a certain condition (e.g., diabetes), or all female patients aged 21 or greater.

The second type of query is used to ask questions about the health care status of patients in the chosen sub-population. For example, if an initial query is used to identify those patients with diabetes, then the second type of query can be used to ask questions like “Which of our diabetic patients have not had an eye exam in the last year?” or “Which of our diabetic patients are out of control based on their last HbA1c result?”

It is critical that the lists of patients include not only useful demographic data for each patient in the lists, but also the associated data that helps to understand why the listed patients are in the list.

Queries help care teams take action toward proactive population care. The appropriate actions can range from doing nothing (just learning and measuring) to assigning a team of people to contact everyone on the list today (as in the case of a serious medication recall). Usually, the appropriate action falls between these two extremes, for example, creating a mailing or call list for the patients on the list, reminding them to come in for a specific type of treatment, test, or screening. Support for direct outreach to patients can be provided through a variety of mechanisms, including automatic or customized emails, phone calls, and postal mail.

An information system that supports quality improvement should be able to tie the outreach to a patient’s specific data with a rationale for why this is an important issue to resolve and the benefits of doing so—for instance, the rationale for having a particular lab test done promptly. Another benefit of queries is to identify changes that are needed to the system of care—for instance, if a large number of patients are not showing the health results that would be expected based on their care. Using queries to explore *why* patients may not be responding to their care may uncover other opportunities for improving the system of care.

Health IT systems that support improvement of proactive population-based care will need several quality characteristics related to queries and follow-up:

- ***The ability to query the database should be open to everyone who is involved in improvement activities:*** Anyone on a care team should be able to ask any questions about their patient group (panel). Primary care practices will need to determine who in their practice can query the database in support of proactive care for populations. Practice currently ranges from “only a few select people” to “anyone in the practice.” A good answer will address issues about who should see data from which patients.

- ***The health IT system should support instant access to query results:*** Instant availability of results is essential to supporting improvement. Any time a query has to be passed to someone else to run, or has to be put in a queue for overnight processing (or worse, days and weeks), the energy for the effort necessary to drive improvement is diminished. When a query is generated from an experience with a patient or a conversation with another provider, and while the idea (question) is fresh, an answer has the biggest impact. For example, recently a doctor relayed an experience in which she was examining a patient who is diabetic and had recently become pregnant. Immediately after the patient encounter, the doctor asked, “How many of my diabetic patients are of child-bearing age? Of those, how many are on birth control? How many of them have had any kind of pregnancy counseling?” Because her health IT system allowed her to ask those question immediately, she knew within minutes how many patients she had for each question and who they were.
- ***The querying system should allow the user to ask any question:*** This means that any data in the database should be accessible to being queried. Using terminology defined on the previous page, if a data item exists in the database, a filter can be constructed and built into a query. Furthermore, any set of multiple filters on multiple data items can be combined into a query.
- ***The everyday user of the health IT system should be able to construct and run queries without technical assistance:*** Because database querying is a fairly technical process, the user must be shielded from this technical complexity by an extremely easy to use “wizard.” This means that the interface to the query system should contain defaults that will capture the most common questions, but also provide the option to override the defaults easily. Building needed queries should not require technical assistance except in rare cases.
- ***The user should be able to specify the inclusion of any data items in the reports generated by queries:*** The simplest form of report from a query is a list of patient names. This, however, is rarely enough information; contact and demographic information are a must. However, to support quality improvement, the query system needs to allow the user to specify that the resulting list, or report, can include any desired patient data. This aspect of the query feature promotes investigation, which is a critical component of improvement.
- ***The health IT system should support the ability to “drill down” into data:*** Drilling down into the data can take two forms: (1) by changing the query slightly, for instance by adding another filter or by editing the value criteria in one or more existing filters, the list of resulting patients is refined (drilling into the query), or (2) by linking from the query result to the individual patient records, the user can click on any given patient and see that patient’s data to better understand why that patient is in the resulting query list (drilling down into patient specific data).
- ***The users should be able to save queries for re-use and/or refinement:*** Although there are a number of ways to accomplish this storage of queries, the most successful seems to be the saving of the query logic in a file.

- ***The health IT system should support the sharing of queries:*** If a certain query is found to be useful, the person or team that created it should be able to share it with others who may want to pursue the same opportunity for improvement of care. This sharing must be easy to do, such as simply clicking a button that emails that query to the other interested parties or uploading it to a shared web site for collaborative improvement. Note that what is being shared is not the list of patients which resulted from the query, but the query logic which can then be applied to other panels of patients. To be able to share queries across databases requires certain standardization: query structure, database structure and fields, and the process for sharing the queries themselves.
- ***The types of action taken on the lists of patients in a query need to be flexible:*** The system should support a complete list of possible actions that can be taken on the list of patients (e.g., automatic emails or phone calls, creation of call lists, notifications to specific members on the care team or even providers outside the care team, creation of reports that summarize findings from the list, the placement of a reminder into the patient’s record so that at his or her next encounter the issue is addressed).
- ***The action taken on the list should incorporate and use patient data to further segment the action:*** The system should be able to utilize other pertinent patient-specific data to adjust which patient gets which action. For example, if the query results in a list of diabetic patients who have not had a HbA1c in the last six months, the action could be different for those diabetic patients whose last HbA1c was above 10 (possibly direct phone call), and from those whose last HbA1c was in control (an automatic letter reminder to come in at their convenience). Also, including the actual patient data in the contact (by letter, email, or phone) can help the patient become more involved and understand the need for action.
- ***The system needs to automate the actions whenever possible:*** This is an area where an electronic system can improve efficiencies. When appropriate, automated contact can save resources and provide completeness in a way that individual manual contact cannot. Of course, care must be taken that automated contact is appropriate. Whereas an email or letter reminder of the need for an eye exam would seem very appropriate, an email notification of the results of an HIV/AIDS test would not.

## **Whole Patient (Planned) Care**

Most patients’ health needs are a mixture of acute episodes like a strep throat, treatment of chronic conditions like asthma or hypertension, and recommended preventative and health promotion activities such as routine screenings, vaccinations, or smoking cessation support. For a health IT system to support the “whole” patient, it must be able to present a coherent view of all aspects of the health status of the patient. Several types of functionality will contribute to improvement of care for the “whole patient.”

A summary of all pertinent patient data should be available in one place to support the planning of care. At a minimum, the “whole patient” view should include demographics, vital signs, a problem list (including current and past conditions), a medication list, past labs and other diagnostic tests for the patient, vaccinations and immunizations, risk factors, other relevant

measures (such as PHQ score for depression, or number of cigarette packs smoked per day), consults and education, referrals, notes, and reminders. These data items need to be densely displayed so that they fit into one screen (without the need to scroll) or onto one piece of paper. (See Tufte: *The Visual Display of Quantitative Information*<sup>5</sup>, pp 167-168 for an overview of why and how dense data displays result in better use of information and do not result in information overload or confusing the user.) The display should also include data items that are clinically related to existing patient data. Evidence-based reminders can be unobtrusively indicated by using differentiation or affordances (visual clues to the function of an object), as opposed to using attention-distracting and time-consuming pop-ups that require separate clicking.

The ability to view data over time is fundamental to understanding and coordinating improvement efforts. At a minimum, time-ordered display of numeric data (run charts) should be available at the click of a button. Ideally, the run charts should include annotations of pertinent changes in therapies. Another type of display is the traditional flowsheet. An electronic version of a flowsheet provides much more flexibility than the traditional paper flowsheet. With paper-based flowsheets, the user is limited in the number of data items being tracked and the number of encounter columns to display. With an electronic flowsheet, these limitations go away.

A well-designed health IT system will use existing patient data (such as diagnoses and lab values) to produce materials for the patient. The provider should see a choice of recommended materials and select the one(s) that are clinically appropriate for the patient. Clearly, the materials should include the patient's own data to help make the educational interaction more meaningful.

### **Quality characteristics of a system for planned care for individual patients**

- ***Data for the “whole patient” should be displayed in one place:*** Even those health IT systems that capture most of the pertinent data for great care often do not have mechanisms for pulling the data into a single location. A single, comprehensive display will require sophisticated design allowing a dense display of data that is easily readable and reflects the unique situation of each patient.
- ***The “whole patient” display of patient data should be dynamic in order to match the dynamic nature of each patient:*** Each patient is a dynamic entity or system; therefore, the data needed to guide care are also dynamic in nature. This means that template-based displays of patient data will fall short of displaying a comprehensive summary of all of the pertinent data. Each patient is different and each patient's health-related data change over time.
- ***The “whole patient” display of data should be used for planning, conducting, and following up after the patient encounter:*** To plan for the care of the 15 to 30 patients to be seen by the care team on a given day (or the following day), using the paper chart is an exercise in futility. Many important aspects of care for most of the patients will be missed, including important interactions between conditions and the treatments for those conditions. Few teams can afford the five, or ten, or even 20 minutes it might take to collect all the necessary information from the chart. Even with most electronic medical records, the

important data are scattered in many places and reviewing all that data in all those places requires too much time. If all the necessary data, along with the evidence-based prompts and reminders, are on one page or one screen, then it is possible to review the planning for 15 to 30 patients in less than 30 minutes. The same rationale holds for both conducting the encounter (face-to-face or virtual) as well as follow-up to the encounter.

- ***The “whole patient” display of patient data should support care across all conditions and health issues, not just the complaint that brings the patient to a particular encounter:*** For patients with multiple conditions, the interactions between these conditions are often overlooked. Even if the patient has come in today for a sore throat, the provider can quickly assess and address the patient’s diabetes or asthma care.
- ***The “whole patient” display of patient data should act as a central location for other views of patient data, such as run charts of lab results and vitals:*** Critical to the idea of a central location for viewing the “whole patient” is the concept that these other views (run charts, electronic flowsheets, etc.) should be only one click away and the “whole patient” view remains on the screen and is the main screen again when the run chart or flowsheet is closed.
- ***The “whole patient” display of patient data should incorporate evidence-based prompts and reminders in a useful and non-intrusive way:*** In most health IT systems, prompts and reminders are in their own location (not in a single “whole patient” view) or are scattered about in various templates. When the evidence-based prompts and reminders are displayed (perhaps using color-coding to represent priority or severity) within the single, “whole patient” view, the provider (and the rest of the care team) can not only see and react to the reminder, but can also see the context for the reminder.
- ***The health IT system should provide a portal for the patient for both input and viewing data, giving the patient some control over his/her record:*** Although there is controversy over the issue of ownership of the data, almost everyone agrees that patients should have access to their clinical data and even ability to input data (for example, weight or blood pressure readings from home). These are important steps to involving patients in their own care. The portal should also provide an additional channel of communication between the patient and the provider, which allows the patient to ask questions or divulge information that he/she forgot or was too embarrassed to tell the provider at the last visit.

## **Measurement**

The health IT system must be able to provide feedback to the care team, organization, and patient about the quality of care actually delivered. Measurement is a key tool for knowing if changes to the health care system are actually resulting in improvement.

The reporting of key measures of quality of care is one critical area of functionality. Measurement needs to be automated to produce summary statistics on a regular basis. However, the system also needs to support the ability to manually ask the system, at any time, to produce a key measures report.

Tracking process and outcome over time (months) will allow the care team to determine if they are progressing, and at what rate. Trends that can be subdivided by demographic measures (sex, ethnicity, age, etc.) can be used to investigate the impact of demographic factors on the improvement effort.

Standard measures can be used to compare one group with another (providers, clinics, organizations, etc.), but there is a danger that over time standard measures can be “gamed.” If the stakes are high, the stakeholders may resort to improving the measures instead of the care. For example, a clinic may not accept certain high-risk patients if they would adversely affect performance measures.

Allowing the care team to modify or add additional measures without requiring vendor or IT resources allows the care team to quickly test new ideas that may result in an improvement. This ability will encourage the provider team to innovate and facilitate the health care improvement process buy-in.

Health IT systems should facilitate a patient-oriented view of the quality of care. Bundled measures<sup>6</sup> or indexes allow easy tracking of how often all recommended care is being delivered. These measures reflect patient expectations regarding clinical quality, i.e., that all recommend tests and treatments appropriate for his/her condition are performed and that his/her outcomes are acceptable. Bundled indexes are harder to “game” than standard indexes.

### **Quality Characteristics of a Health IT Measurement System**

- ***The measurement module needs to allow the user to customize any report by adding or changing a filter:*** To help the care team explore why a particular measure or set of measures are not showing improvement, it is often useful to run the “standard” report with a modifying filter to drill down into specific sub-sets of patient data. It is often very useful to run reports by provider, by site, or by some patient designator.
- ***The query and filter structures for measurement and reporting features should be identical to those used for the proactive population-based care tool and for reminders and prompts:*** Many current health IT systems utilize two or more separate sets of criteria for bringing evidence-based guidelines to bear. For example, a number of systems have a set of criteria for generating prompts and reminders for a specific patient, yet they have a different set of criteria for running population queries about whether patients have received care that is evidence-based. Using a single system of querying and filtering for both measurement and reminders has important benefits. First, a consistent set of evidence-based guidelines will also help identify patients in need of care (proactive population-based care). And second, this design results in a simpler system, allowing clinicians to maintain and fully utilize the prompts and reminders, the reporting system, and the tools for proactive population-based care, without the need to depend on information technology specialists (except in rare, extremely complex situations).

## Other Quality Characteristics of Health IT Systems That Support Quality Improvement

Additional quality characteristics contribute both to successful proactive (population) care and planned (“whole patient”) care, including:

- ***Ability to customize the data presented, as well as the “look and feel” of the data, at the user level:*** A critical aspect of ongoing improvement of care is the cycle of investigation and learning. To keep that cycle vital, the methods and tools for investigation and learning must adapt as knowledge grows and spawns more questions. For example, if certain cycles of learning point towards pain management as an important potential source of improvement, then the health IT system has to allow the users to add and track pain management issues that may not have been present in the system before.
- ***Ease of use:*** A common theme emerged in our conversations with organizations and teams that are successful at ongoing improvement of care: they feel that they should not be reliant on information systems specialists to use the health IT system effectively. This means that the system has to be sophisticated enough to track any data and to ask any question, and that the user must feel that they can do all of that without technical guidance (or at least without much and not often). Health IT has not yet experienced leaps in user-friendliness similar to the advent of the first Apple Macintosh computer, or the broad availability of desktop publishing software that allows a non-designer to produce polished publications.
- ***Interoperability:*** Within discussions of Information Technology, the term “interoperability” can be used to include a wide array of concepts. For our purposes, we will use the IEEE definition: the ability of two or more systems or components to exchange information and to use the information that has been exchanged.<sup>7</sup> From the user’s perspective, all electronic data systems should appear as if they get their data from one database. Assuming that lab results are produced in a separate database, the lab results should flow electronically into the clinical database at regular intervals, behind the scenes. The same principle applies to the practice management system and any other data system in use. If data have to be entered in manually in one database, they should never have to be entered again.
- ***Data available across the entire continuum of care (all settings and providers):*** This quality characteristic is related to interoperability. If all or most health IT systems were interoperable, then connecting primary care to specialty care, emergency room, general hospital, urgent care clinics, dental offices, etc., would be achievable. There is a clear need for having data from the continuum of care available for improvement efforts.
- ***Appropriate data structures to support improvement:*** If the purpose of the health IT system is to support ongoing improvement of care, then data need to be stored and displayed in a way that is actionable. For instance, the results of a Pap smear often contain verbose descriptions of findings in no specific order. However, for improvement activities, the kernel of knowledge that would make the Pap smear actionable is the Bethesda scale and the date. Similarly, data that are constrained to billing codes may make it very difficult to track the progress of a chronic diagnosis over time.

- **Automation:** For both proactive population-based and individual patient care, automation can play a significant role in improving care. For example, for population-based proactive care, the system should automate the contacting of the appropriate patients. An example of automation to support better individual patient care would be the automatic generation of patient education handouts (including and utilizing patient-specific data and information). Once an action is determined to be appropriate for better care, the health IT system should produce the action based on patient data, in many cases without even requiring provider interaction. An example would be the production of a mailing list for all diabetic patients who have not had an eye exam in the last year.

## Change Concepts

Change concepts are general notions or approaches that are useful in developing specific, actionable ideas for change that can be tested and that will lead to improvement. A useful change concept will stimulate many testable change ideas that can be pursued in practice, and helps to widen the field of testable ideas that can be considered. Being able to generate specific change ideas from broad change concepts is a key improvement activity.

We describe three broad change concepts:

1. Use of models, including models of the desired care system and models of improvement;
2. Focus on a practical, patient-oriented view of functionality and what it should be able to accomplish; and
3. Use of learning strategies to accelerate progress in testing and applying change ideas.

### Change Concept #1: Use of Models

Two kinds of models can be especially useful in implementing health information technology to support improvement: a model of the desired system of care, and a model for generating improvements in that system.

Having a model to describe the system of care is critical for successful adoption of technology for several reasons. A model allows the organization to articulate the desired performance of their system and to understand how close the current system is to the intended one. It helps in identifying those areas where technology can help move the system to its intended state. It allows informed choice about what kinds of technologies are needed to support improvement, and how those technologies should be adapted and implemented. Because the adoption of technology will bring unforeseen issues, having a model provides guidance for dealing with the unexpected without losing sight of the aims of the whole system. A model provides a mechanism for maintaining and expanding technological tools over time.

A care model can be understood as a current best approximation for what perfect care would be. Models describe an optimal system, which may never be fully attained, but that is worthy of continuing pursuit. A model of care is not fixed and final, but can be enhanced by learning gleaned through the improvement process.

The second type of model, a model for how to improve the system, provides the means to move closer to the idealized model of care. Deming and others have described the basis for a robust model for improvement, one that is grounded in “profound knowledge.” Profound knowledge, in Deming’s formulation, includes systems theory, a theory of knowledge, understanding variation, and psychology of people. Therefore, a useful model for improvement will incorporate an understanding of people, how people learn, an appreciation for complexity of systems, and dynamics of “inherent” and “special” variation in systems. Deming left a rich legacy of writings and these should be fundamental source material for the organization intending to improve.

Most models for improvement make use of a plan-do-study-act (PDSA) cycle that is based on how people learn and are motivated for improvement. Using PDSA cycles allows teams to clarify the aim for improvement, measure impact of improvement, and develop, adapt, and implement changes. (Some sources for learning about improvement methods are provided in Appendix A.)

In organizations that are skilled at improvement, the care system model and the model for improvement are integrally connected. The model for improvement is the vehicle for closing the gap between the current state and the intended model of care. Use of the model for improvement actually allows the care model to be extended and improved, and the vision of care to be expanded. The care model points to a vision of the future; the model for improvement allows practical action today in pursuit of that vision.

## **Change Concept #2: Practical, Patient-oriented Description of Technology**

Much of the current discussion of health IT focuses on the reduction of waste in administrative processes or the avoidance of certain kind of dangerous errors, such as medication errors, lost lab results, etc. In the previous section we proposed certain patient-oriented functionality as the starting point for assessing, adapting, and implementing health information technology.

These kinds of improvements will clearly bring positive results to patients and are consistent with quality concepts of “mistake-proofing” processes. As important as these improvements are, however, once accomplished they have limited potential to generate significant, continuing improvements over time. Using technology to improve the system of care will offer large and ongoing opportunities for improvement, including optimizing the care team and involving patients and families as partners in care.

Some technologies can offer benefits in both areas. Reminder systems can help to prevent errors, and they can also be used to support implementation of a robust model of care. A reminder system could alert a provider to a drug allergy, thereby avoiding an error; it could also remind a provider to perform certain screening or preventive care, increasing the overall value of an encounter to the patient. Report writing is another function that has relevance in both areas. Reports can support reduction in errors by focusing on compliance with currently expected practice; reports can also be used more flexibly as a tool for learning that is available to all.

### **Change Concept #3: Adopt Learning Strategies To Accelerate Progress In Testing And Applying Change Ideas**

Improvement is a participatory activity, highly reliant on active testing via PDSA cycles and open sharing of what has been learned that will support additional testing and implementation. Learning communities can be a helpful way to accelerate change. They can support growth in understanding the health IT functionality that supports improvement in care, help larger numbers of users evaluate and adapt existing tools and systems, and provide guidance on how to test a promising idea in a variety of settings. Given the challenges of health IT interoperability, local learning communities can make interoperability, at least on a local level, more feasible by sharing technological links.

Communities can be constructed in many ways, from highly informal to more structured. The span of their focus may be on:

- Clinically related areas of improvement, such as chronic care or how best to apply the available evidence to patients with multiple complex conditions;
- Operational improvements that affect quality of care, such as flow and access; and
- How technology can best be used to support effective care processes, such as how to empower patients using technology, or the best ways to design reminder and alert systems

Many types of learning relationships can be built, whether bringing together multidisciplinary learning groups within a single organization, using listservs to link individuals across organizations, encouraging opportunities for observation of the work of peers in other organizations, or formal collaborative learning methods.

#### **Specific Change Ideas**

To translate a broad *change concept* into specific actions requires identifying specific *change ideas* that are consistent with that concept. Change ideas are dynamic: as experience grows, new ideas come to light. Appendix A presents some suggested change ideas and some potential ways of testing them. Each practice will need to determine what would be the most helpful tests to aid their learning and continuous improvement.

#### **Implications for Spread**

A goal of this project was to identify a number of successful practices ready for spread to large numbers of primary care organizations. In actuality, while we found many primary care practices that were highly committed to using health IT, and were extremely resourceful in applying it to improving the quality of care, we found few examples of changes ready for spread. This should not be highly surprising, as health information technology that supports robust quality improvement is at a relatively immature stage of development.

The work of Everett Rogers suggests some typical attributes of “spreadable” ideas<sup>8</sup>:

Relative advantage: The degree to which innovation is seen as superior to the idea it supersedes

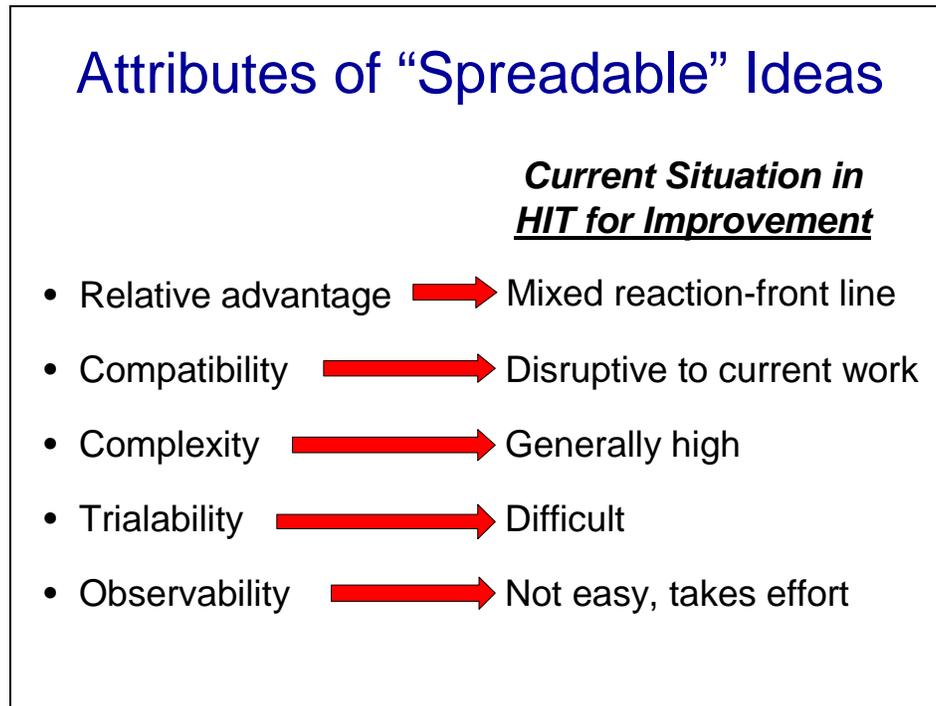
Compatibility: The degree to which an innovation is perceived as being consistent with existing values, past experiences, and needs of adopters

Complexity: The degree of difficulty to adopt and use

Trialability: The degree to which an innovation can be introduced on a limited basis

Observability: The degree to which results are visible to those testing and to others

However, health IT for improvement exhibits these attributes weakly, if at all:



Furthermore, the traditional view of adopter categories may oversimplify the differences in need between the innovative and early adopter groups, versus the early majority. Some suggest that “early majority” users are highly intolerant of technology that is unreliable, complicated to use, and non-standardized.<sup>9</sup>

Nonetheless, there is significant outside pressure on primary care clinicians to adopt health IT from regulators, health plans, health networks, and, increasingly, patients. Therefore, an appropriate strategy may be to foster additional testing and learning related to the proposed health IT functionality for improvement and to establish spread-based mechanisms to disseminate that learning. We do believe that sharing, and inviting testing and input, would accelerate the field’s readiness to adopt health IT for quality improvement when it becomes more robust.

## **Opportunities for Innovation in Health IT to Support Improvement of Care in Primary Care Settings**

A number of areas emerged from our study where technical innovation could help accelerate the development and use of health IT for the improvement of patient care. While we know that a

great deal of both research and prototyping is currently underway in these areas, we hope it may be helpful to draw out implications related to how health IT can support ongoing improvement in quality of care. We have summarized our observations below:

## **Data Structures To Support Improvement**

Many of the data collected in health care are complex. For purposes of documenting the medical record, this level of complexity can often be justified (for reasons of totality and legality). However, in many situations, the level of detail appropriate for medical documentation can get in the way of using the data for the improvement of care. This is especially obvious when the data are used to guide action across a population of patients.

To support improvement of care based on data, especially for groups of patients, data need to be available to the provider (care team) in a form that supports quick and concise interpretation. For example, the full documentation of a Pap smear is often highlighted by commentary from the analyst. This commentary may bring some depth to the interpretation of the Pap smear that should be documented when further inquiry is warranted. However, to support proactive care for patients (especially groups of patients), the Pap smear result stated in the Bethesda scale is all that is needed. Further, since the Bethesda scale is a fixed finite set of results, the computer can apply evidence-based guidelines to these results very easily. Attempting to design a computer program to respond appropriately to the general Pap smear report is a monumental (and probably futile) task. The result delivered in a Bethesda scale is actionable with strong support from an electronic system, whereas the full textual report is problematic.

Another aspect of data structures that continues to restrict improvement activities is the billing and reimbursement coding mindset that permeates much of health care data. For example, in many health IT systems, patients with asthma do not have a diagnosis of asthma; they have a data history of billed visits with a billing diagnosis code of asthma. For visits to the clinic that did not involve their asthma (and hence no billing code of asthma was issued), there is no way to relate that visit to their chronic condition of asthma. Additionally, an asthma billing code is often used for a patient who arrives wheezing (whether they have a diagnosis of asthma or not). This may not look like a data problem on the surface, but if you ask the health IT system how many asthmatics are in a panel, the numbers may be far from reality. While we're trapped in the reimbursement code mindset, it will be hard to come up with data structures that allow clinicians to truly understand the whole clinical picture of their patients.

Research and innovation are needed to define data structures that are actionable and to build a consistent approach to operationally defining these actionable data structures from the complex medical data that make up much of the medical record today. Computer systems should be designed to take advantage of actionable data structures (for example, set all the default settings to the simpler actionable data structures and allow the complexity to be accessed only when it is vital through easy-to-use data-query wizards).

## **Dense Display of Data**

Humans are complex and dynamic systems and, therefore, the data that might provide a representation of that complexity and dynamic nature will require clever new methods of being displayed. To facilitate the interpretation of complex and dynamic displays of data and the use of the gleaned knowledge in a busy practice, all the pertinent data need to be in one location (see the discussion about the functionality needed to support the improvement of care for individual patients). However, if the electronic system is going to put all the pertinent data on one screen, the science of dense displays of data will need to be exploited.

The standard design of health IT system today is template-based. Every screen is the same for all patients (except, of course, for the patient specific data entered). This design makes sense for a system whose main purpose is documentation. However, if the purpose of the system is to support improvement of care, then the template design falls short in its ability to track and display the diversity in patients. Dynamic systems (people) require dynamic displays.

It is fundamental for ongoing improvement of care that providers can see the information in the data quickly and without missing the interactions (conditions, meds, labs, patient goals, etc.). Human brains are designed for complex pattern recognition processing; therefore, the more data, correctly arranged, the better. Some useful work in this area has been explored by Edward Tufte and others, but the specific application to the design of a “whole patient” view is in its infancy. Hence, this is another area where innovation is needed. [See Tufte: *The Visual Display of Quantitative Information*,<sup>10</sup> pp. 167-168 for an overview of why and how dense data displays result in better use of information and do not result in information overload or confusing the user.]

## **Transferability of Data**

Most experts agree that we are a long way from having a health IT system that can handle all aspects of the continuum of care (scheduling, billing, in-patient, primary care, specialty care, laboratory results, etc.). This means that the sharing of data across various health IT systems is a critical issue for any providers who want to adopt health IT. Although there has been much talk and activity around standards for data transferability, the overall effort has been haphazard and piecemeal. There does not appear to be an emerging common structure for health care data. In other words, we are nowhere near the standards-setting stage. Innovation and research are needed into how best to share data.

Data structures for billing and documentation are often very different from the data structures that best support improvement. This is best illustrated by the experiences of those who have built interfaces between different types of health IT systems. Several health IT experts in our study spoke of the effort to build interfaces between EMRs and chronic disease registries. The assumption was that EMRs would have many data elements that would not have a home in the registries, and that the EMRs would have a data home for all the data from the registries. In fact, both systems had data that did not have homes in the other system. Simply put, the systems relied on different types of data. For example, the registries were being used to track data on the number of times a patient exercised or the number of cigarettes smoked per day or the last PHQ

score, and the EMR had no specific places to store these types of data. The lack of the designation of a diagnosis in most practice management systems (essentially billing systems) has already been discussed.

Some related areas in need of innovation and research are:

- Design of the sharing systems (one warehouse with many feeds or many feeds that all share interfacing structures);
- Ownership of the data (including responsibility of accuracy);
- Measures of accuracy of the data; and
- The issue of data structures (already mentioned), specifically for interfacing health IT systems that serve different purposes.

## **Customization**

Ongoing improvement of quality requires the ability of the care team to ask new questions or, at least, slightly different questions. There is a natural progression of learning that is used to support changes and more learning. With poor ability to customize, a health IT system will stifle this type of learning and, therefore, improvement efforts. Some specific areas where customization is useful for improvement are:

- Querying the system (ability to create custom reports by adding or editing queries and altering the list of data items that are displayed).
- Adding new data fields.
- Adding practice specific (or even patient specific) reminders.
- Building relationships between data items (e.g., when X shows up, I want Y to show up with X).

On the other hand, evidence-based guidelines should be protected from being adjusted (in the name of customization), except when the evidence changes. In other words, fixed standards are best set by an agreement of the larger body of clinicians and scientists, and customization should be at the discretion of the individual provider (with the ability, of course, to share the customization ideas with others). We are faced with a tension between standard, static features and the ability to customize to support improvement. Currently, almost all systems err on the side of inflexibility, which results in stifling improvement. Research and innovation are needed into how to optimize around this tension.

## **Optimal Design of Alerts and Reminders**

With most health IT systems, users find ways to turn off or circumvent portions (or in some cases all) of the alerts and reminder systems. Typically, alert systems are designed such that a response is required, or they display an alert while the provider is in the middle of an important interaction with the patient and health IT system. After several days or weeks of that, providers learn to bypass.

Human factors design, combined with medical understanding and prioritization, could go a long way to creating a much better system of alerts and reminders.

## **Designs That Are Patient-Centric (Patient-Controlled) PHR, Communications, Home as Hub**

Despite the positive coverage of the idea of patient-centeredness, the patient is typically nowhere near the center in the functioning of health IT systems. Again, this is due to the history of health IT being focused on billing and documentation, both of which patients are traditionally kept away from.

Opportunities for innovation abound:

- Patient portals with direct access to their data for commenting and adding.
- Secure electronic communication between patient and care team.
- CPOE where the P stands for patient or at least patient and provider (CP<sup>2</sup>OE).
- Home as hub.
- Patient-controlled record.
- Patient can see the costs associated with medications and labs before they are ordered.

## **Summary**

In brief, this project permitted an inquiry into how health IT could support the ongoing process of improving systems of care. We hope that the ideas presented, especially those related to functionality, will be tested, challenged, and improved by primary care and information technology staff at the front lines. We also hope that lessons emerging from practical tests will help to shape the development of future technologies. It is impossible to imagine a truly effective health care system without superb information systems. Although there is a long way to go, there is no doubt that the experiences, commitment, and wisdom of the primary care community will help to get us there.

## Appendix A: Change Ideas

To translate a broad *change concept* into specific actions requires identifying specific *change ideas* that are consistent with that concept. Change ideas are dynamic: as experience grows, new ideas come to light. In the sections below, we have presented some suggested change ideas and some possible ways to test them.

### Change Concept #1: Use of models

<i>Change Idea</i>	<i>Potential Tests</i>
Test aspect(s) of care model on a patient or group of patients.	<ol style="list-style-type: none"> <li>1. Review sources of information on care models as input to your own model. <ul style="list-style-type: none"> <li>▪ Information on Care Model: <a href="http://www.ihl.org/IHI/Topics/PatientCenteredCare/SelfManagementSupport">http://www.ihl.org/IHI/Topics/PatientCenteredCare/SelfManagementSupport</a></li> <li>▪ Information on Chronic Care Model: <a href="http://www.improvingchroniccare.org/">http://www.improvingchroniccare.org/</a></li> <li>▪ Health disparities model Web site: <a href="http://www.healthdisparities.net/hdc/html/home.aspx">http://www.healthdisparities.net/hdc/html/home.aspx</a></li> </ul> </li> <li>2. Work to improve an aspect of your chosen care model. <ul style="list-style-type: none"> <li>▪ Select an element of care model and your practice related to that care model.</li> <li>▪ Establish an improvement aim for that aspect of model.</li> <li>▪ Run at least one test of change.</li> <li>▪ Fill out the ACIC (Assessment of Chronic Illness Care): <a href="http://www.improvingchroniccare.org/index.php?p=Survey_Instruments&amp;s=165">http://www.improvingchroniccare.org/index.php?p=Survey_Instruments&amp;s=165</a>; <a href="http://www.improvingchroniccare.org/downloads/acic_v3.5a.pdf">http://www.improvingchroniccare.org/downloads/acic_v3.5a.pdf</a> ;</li> <li>▪ Generate action plan to address issues that have come up in the ACIC.</li> </ul> </li> </ol>
Involve patients in improvement.	<ol style="list-style-type: none"> <li>1. Ask a couple of willing patients to collect data relevant to their health (e.g., blood pressure, weight) and bring it to their next appointment.</li> <li>2. Work with patient to plot data over time in a graphical display.</li> <li>3. Work with patient to annotate run chart with other events such as medication use or exercise participation.</li> <li>4. Incorporate patient-generated data into patient's record.</li> <li>5. If available, use remote monitoring to incorporate patient data into record (e.g., for blood pressure).</li> </ol>

<p>Learn and apply a model for improvement.</p>	<ol style="list-style-type: none"> <li>1. Learn the basics of using a model for improvement. Many resources are available, including: <ul style="list-style-type: none"> <li>▪ Institute for Healthcare Improvement’s free resources on how to improve: <a href="http://www.ihl.org/IHI/Topics/Improvement/ImprovementMethods/HowToImprove/">www.ihl.org/IHI/Topics/Improvement/ImprovementMethods/HowToImprove/</a></li> <li>▪ Institute for Healthcare Improvement, on-line learning module: <a href="http://www.ihl.org/IHI/Programs/AudioAndWebPrograms/GausModelforImprovement.htm">www.ihl.org/IHI/Programs/AudioAndWebPrograms/GausModelforImprovement.htm</a></li> <li>▪ Healthcare Improvement Skills Center: <a href="http://www.improvementskills.org">www.improvementskills.org</a></li> <li>▪ American Society for Quality: <a href="http://www.asq.org/learn-about-quality/continuous-improvement/training/index.html">www.asq.org/learn-about-quality/continuous-improvement/training/index.html</a></li> <li>▪ National Initiative for Children’s Health Care Quality: <a href="http://www.nichq.org/NICHQ/Programs/ConferencesAndTraining/JumpAhead2006.htm">http://www.nichq.org/NICHQ/Programs/ConferencesAndTraining/JumpAhead2006.htm</a></li> <li>▪ <u>The Improvement Guide</u>, by Langley et al, 1996, published by John Wiley &amp; Sons.</li> </ul> </li> <li>2. Read about PDSA cycles and run one by yourself in less than 4 hours. <ul style="list-style-type: none"> <li>▪ Share what you’ve learned with a colleague.</li> </ul> </li> <li>3. Run a PDSA cycle with a team of 2-3 people that can be accomplished in no more than 4 hours. <ul style="list-style-type: none"> <li>▪ Share experience with PDSA cycles with a colleague working in a different area and coach each other on how the PDSA cycle could have been improved.</li> </ul> </li> <li>4. Review recent PDSA cycles run in your organization and, for any that took longer than 2 weeks, describe how they could have been run on a smaller scale and a shorter time.</li> <li>5. Describe the learning that occurred across a series of sequentially related cycles to your senior leaders or your board of directors.</li> </ol>
<p>Use data displays to understand changes in patients’ condition and to plan future care.</p>	<ol style="list-style-type: none"> <li>1. Identify two patients with coronary artery disease, and gather their LDL measures as far back as possible and plot on run chart. Annotate plot with medication changes and other significant changes in care or lifestyle.</li> <li>2. Identify a patient with diabetes and hypertension. Gather blood pressure and weight measurements and do both run chart and scatter diagram. <ul style="list-style-type: none"> <li>▪ If appropriate, identify and carry out changes in care.</li> <li>▪ Rerun data after changes in care have been put into effect.</li> </ul> </li> <li>3. If successful in using data to improve the care of a few individual patients, search for additional change ideas relevant to your practice and test them. Some sources for ideas</li> </ol>

	<p>are:</p> <ul style="list-style-type: none"> <li>▪ The care model (see sources above)</li> <li>▪ Measures of access and efficiency: (<a href="http://www.ihl.org/IHI/Topics/OfficePractices/Access/">http://www.ihl.org/IHI/Topics/OfficePractices/Access/</a>)</li> <li>▪ Measures of process reliability: (<a href="http://www.ihl.org/IHI/Topics/Reliability/ReliabilityGeneral/">http://www.ihl.org/IHI/Topics/Reliability/ReliabilityGeneral/</a>)</li> <li>▪ Providing planned care: (<a href="http://www.ihl.org/IHI/Topics/OfficePractices/PlannedCare/">http://www.ihl.org/IHI/Topics/OfficePractices/PlannedCare/</a>)</li> </ul>
<p>Measure your practice's current level of quality of care and use the measure(s) to test changes in the delivery of care.</p>	<ol style="list-style-type: none"> <li>1. Familiarize yourself with some quality indicators relevant to your practice. Sources include: <ul style="list-style-type: none"> <li>▪ Ambulatory Care Quality Alliance: <a href="http://www.ahrq.gov/qual/aqastart.htm">http://www.ahrq.gov/qual/aqastart.htm</a></li> <li>▪ QualityNet, supported by the Centers for Medicare &amp; Medicaid Services: <a href="http://www.qualitynet.org/">http://www.qualitynet.org/</a></li> <li>▪ National Quality Forum: <a href="http://www.qualityforum.org/">http://www.qualityforum.org/</a></li> </ul> </li> <li>2. Collect some basic measures on your patient panel. An example could be: <ul style="list-style-type: none"> <li>▪ Number of diabetic patients in your panel</li> <li>▪ The number of diabetic patients whose last HBA1c is in control/not in control</li> </ul> </li> <li>3. After trying the measures above, select a couple of additional indicators that your organization or care team views as important for that population and plot them over time. Try to calculate the measures historically for at least one month, this month's data, and prepare system to calculate next month's data. <ul style="list-style-type: none"> <li>▪ Go farther back in time.</li> </ul> </li> <li>4. Track "all-or-nothing" measure for a group of related clinical measures.</li> <li>5. Add related non-clinical measures, such as cost, efficiency.</li> <li>6. Segment your patients by provider, site, or patient characteristic, and relate these segments to quality indicators.</li> </ol>

**Change Concept #2: Practical, patient-oriented description of technology**

<i>Change Idea</i>	<i>Potential Tests</i>
<p>Use information from health IT system to plan population care.</p>	<ol style="list-style-type: none"> <li>1. Find a way to list all diabetes patients in your practice. This list should include all necessary demographic contact information and DM-related data. (Note: This idea can be applied to other conditions and even preventive care such as cancer screening, etc.) <ul style="list-style-type: none"> <li>▪ From the DM list, create a sub-list of just those DM patients who have not been seen at your clinic in the last 6 months.</li> <li>▪ Contact them and get them in for a visit.</li> <li>▪ Assess your experience: To what extent were you able to use electronic systems for creation of the list and sub-list? To what extent were you able to use electronic means to assist in contacting patients?</li> <li>▪ Expand to other areas.</li> <li>▪ Possible steps to help guide the work described above: <ul style="list-style-type: none"> <li>– If you have a practice management system, “pull” the necessary data from that system and then “pour” the data into Excel (or some similar tool).</li> <li>– If you do not have an electronic system that contains diagnosis information for your patients, select 100 records at random and quickly sort into DM and non-DM. For those DM patients, extract the necessary information from their records (demographics and DM-related data). Have an assistant enter this data into an Excel file.</li> </ul> </li> </ul> </li> <li>2. Use an existing public domain, free registry system, such as CVDEMS (<a href="http://www.cpc.org/healthcollabs/issupport/bphcis.cfm#cvdems">http://www.cpc.org/healthcollabs/issupport/bphcis.cfm#cvdems</a>) <ul style="list-style-type: none"> <li>▪ Get data into the registry (electronic import if you can, or manually enter data for a few patients).</li> <li>▪ Test the system with a few patients and learn about the proactive functionality. <ul style="list-style-type: none"> <li>– List all DM patients.</li> <li>– List all DM patients with no HbA1c in last 6 months.</li> <li>– Run summary report and explore the interpretation for your practice. (Note: this will provide useful learning even if you only have a few DM patients data in the system. As you add more patients, the value expands.)</li> </ul> </li> </ul> </li> </ol>

	<ol style="list-style-type: none"> <li>3. Connect with a practice that is actively engaged in proactive population-based care. Send one or more people to observe (participate and help with the work, produces even better learning).</li> <li>4. If you currently have an EMR/EHR, plan a set of specific proactive queries. Ask your vendor (or technical experts for the system) to come in and demonstrate how quickly they can produce the appropriate query-producing lists and that the lists contain the data that you need. Do not give them descriptions of the queries ahead of time. It is critical that the system supports quick creation of the queries and the resulting lists or reports.</li> </ol>
<p>Generate population-based activities based on your health IT system.</p>	<ol style="list-style-type: none"> <li>1. Use Excel to automatically create letters for diabetes patients who have not been seen in the last 6 months: <ul style="list-style-type: none"> <li>▪ Build list in spreadsheet program (demographics and diabetes related data).</li> <li>▪ Draft letter in word-processing program.</li> <li>▪ Use mail-merge function to create letters that include patient specific data in each letter (date of last visit, last HbA1c test date and value, etc.).</li> </ul> </li> <li>2. Generate a call list: <ul style="list-style-type: none"> <li>▪ Build a list of diabetes patients in Excel (include columns for tracking call related information, e.g., date of call, how long it lasted, scheduled appointment if one is made, etc.).</li> <li>▪ Have someone call the diabetes patients on list, set up appointments, and record call data.</li> </ul> </li> <li>3. Segment the list by patient need: <ul style="list-style-type: none"> <li>▪ Those who just need a reminder</li> <li>▪ Those who would benefit from more care management (Consider how you will you determine this in setting up the call process.)</li> </ul> </li> </ol>
<p>Conduct planned care for individual patients based on your health IT system.</p>	<ol style="list-style-type: none"> <li>1. Keep track of the data retrieval activities for the next 2 encounters with DM patients. <ul style="list-style-type: none"> <li>▪ Record the number of locations accessed in searching for patient data (include each time the paper record had to be leafed through or if electronic, each screen/template that was reviewed).</li> <li>▪ Record the time required for all the data search and retrieval activities.</li> </ul> </li> <li>2. Make a list of all pertinent data that would be helpful for encounters with DM patients (asthma, cardio-vascular disease, depression, etc.).</li> </ol>

	<ul style="list-style-type: none"> <li>▪ Those that are practical within your current system</li> <li>▪ Those you would wish for in the “perfect” system</li> </ul> <ol style="list-style-type: none"> <li>3. Pick a patient with diabetes and obesity and go through their records to generate a run chart going back at least 2 years. Include: <ul style="list-style-type: none"> <li>▪ Weight</li> <li>▪ BP</li> <li>▪ HbA1c</li> </ul> </li> <li>4. Obtain examples of patient education materials for handout to patients that utilize patient data. If you do not have an electronic system to create these, then manually prepare the handout material for the next 2 scheduled DM patients.</li> <li>5. Ask 2 or more patients with diabetes and hypertension to track their blood pressure on a run chart. Give them a form and instructions for use. Have them bring the run charts (filled in) to their next visits. Ask them to annotate the run charts.</li> <li>6. Describe how you and your care team prepare for an encounter with a patient. Include a description of how evidence-based prompts and reminders are brought into this process. <ul style="list-style-type: none"> <li>▪ Describe the tools you would need in order to do a better job. How could automation help with this?</li> </ul> </li> </ol>
<p>Use measurement to support your proactive (population) care and planned care (whole patient) activities.</p>	<ol style="list-style-type: none"> <li>1. Using your best knowledge of your care system, <u>estimate</u> the following (without using data): <ul style="list-style-type: none"> <li>▪ Total number of patients for which you, your care team, your clinic, or your organization are the primary care home</li> <li>▪ The number of patients with diabetes from the above count.</li> <li>▪ The number of the diabetic patients who: <ul style="list-style-type: none"> <li>– Were seen in the last 6 months</li> <li>– Had a HbA1c test in the last 6 months</li> <li>– Had an eye exam in the last year</li> <li>– Had a result below 7 on their latest HbA1c test</li> <li>– Had a foot exam in the last 12 months</li> </ul> </li> </ul> </li> <li>2. Select records of 10 DM patients at random and calculate the values for the items above. <ul style="list-style-type: none"> <li>▪ Compare your estimates to the calculated values. Where were your estimates</li> </ul> </li> </ol>

	<p>close and where were they not? Why?</p> <ul style="list-style-type: none"> <li>▪ Describe the potential value of actually having solid data for those kinds of statistics.</li> </ul>
<p>Make health IT reporting/query functions available to all team members.</p>	<ol style="list-style-type: none"> <li>1. Choose one or more interested clinicians and train them to run their own queries.</li> <li>2. “Buddy” them with whoever would normally run the queries in your practice and who can help them build queries that will work.</li> <li>3. Make note of any queries that clinicians would like to run that are not available in the system.</li> </ol>

**Change Concept #3: Adopt learning strategies to accelerate progress in testing and applying change ideas**

<i>Change Idea</i>	<i>Potential Tests</i>
Learn by direct experience, using your own team.	<ol style="list-style-type: none"> <li>1. Pilot, or “test drive” software technologies specifically designed to support improvement of care: <ul style="list-style-type: none"> <li>▪ Registries</li> <li>▪ Tools for planned care at the patient level</li> </ul> </li> <li>2. Create partnerships between clinical, information technology, and administrative staff to do the following: <ul style="list-style-type: none"> <li>▪ Develop local interfaces between systems (initially manually for small numbers; eventually electronically)</li> <li>▪ Measure quality of the system</li> <li>▪ Jointly evaluate new health IT products on the basis of patient-focused functionality.</li> </ul> </li> </ol>
Learn from others either providing or directly using technology.	<ol style="list-style-type: none"> <li>1. Visit users of health IT tools and “walk the patient path” or “walk the clinician path”: <ul style="list-style-type: none"> <li>▪ Identify practices that you wish to test in your setting.</li> <li>▪ Identify gaps in functionality for improvement and find out what others have done to fill those gaps.</li> </ul> </li> <li>2. Talk to vendors and review specific products. <ul style="list-style-type: none"> <li>▪ Articulate the improvement functionality you are seeking and provide mock-ups of reports or screens that would serve your improvement needs.</li> <li>▪ With a team of clinical and IT colleagues, evaluate the degree to which a selected product’s functionality aligns with patient-oriented needs.</li> </ul> </li> <li>3. Learn from others who are actively engaged in activities to improve care, and those who are using health IT to support their improvement work. <ul style="list-style-type: none"> <li>▪ Find out what model of care they are using.</li> <li>▪ Find out what improvement methods they are using.</li> <li>▪ Find out how they are currently using health IT to support improvement.</li> <li>▪ Develop at least one test that you can run in your environment to apply health IT to the challenge of improving care.</li> </ul> </li> </ol>

	<p>4. Establish relationships with others outside your organization to share improvement methods and assess technology that supports improvement.</p> <ul style="list-style-type: none"> <li>▪ Do reciprocal site visits with others committed to using health IT for improvement.</li> </ul>
<p>Take advantage of national resources.</p>	<p>1. Study or visit organizations that have been able to adopt quality as their business strategy:</p> <ul style="list-style-type: none"> <li>▪ Recipients of the Baldrige National Quality Award both in health care and other industries: (<a href="http://www.quality.nist.gov/Award_Recipients.htm">http://www.quality.nist.gov/Award_Recipients.htm</a>)</li> <li>▪ Organizations in health care or other industries that have used Toyota Production System, Lean, or Six-Sigma approaches to improving overall quality</li> <li>▪ Study “Pursuing Perfection” grant recipients: <a href="http://www.rwjf.org/portfolios/npo.jsp?FUND_ID=54243&amp;iaid=142">http://www.rwjf.org/portfolios/npo.jsp?FUND_ID=54243&amp;iaid=142</a></li> </ul> <p>2. Learn about or participate in efforts through professional associations or other organizations that support learning, for example:</p> <ul style="list-style-type: none"> <li>▪ American Academy of Family Physicians, Center for Health Information Technology: <a href="http://www.centerforhit.org/">http://www.centerforhit.org/</a></li> <li>▪ American Health Information Management Association: <a href="http://www.ahima.org/">http://www.ahima.org/</a></li> <li>▪ American Medical Association: <a href="http://www.ama-assn.org/ama/pub/category/16681.html">http://www.ama-assn.org/ama/pub/category/16681.html</a></li> <li>▪ American Medical Informatics Association: <a href="http://www.amia.org/">http://www.amia.org/</a></li> <li>▪ California Health Care Foundation: <a href="http://www.chcf.org/topics/index.cfm?topic=CL108">http://www.chcf.org/topics/index.cfm?topic=CL108</a></li> <li>▪ CCHIT (Certification Commission for Healthcare Information Technology): <a href="http://www.cchit.org/">http://www.cchit.org/</a></li> <li>▪ HIMSS (Healthcare Information and Management Systems Society): <a href="http://www.himss.org">www.himss.org</a></li> </ul>

# Assessing and Synthesizing Existing Knowledge on Informatics in Primary Health Care

## Appendix B: Phone Interview Tool – Preliminary Draft 7-21-06 v.2

### Overview

We are interested in learning from your experience with using health information technologies to improve patient care. We'd like to start by asking you to talk about the big picture – what enhanced information technology has meant for your organization and any tips you would have for other organizations that may just be starting their information technology journey.

<b>[THEIR STORY GOES HERE]</b>

[Use the following questions to find out key facts and/or clarify who they may have said while telling their story. We could maybe get the basic facts from organizations ahead of time if they have some material that they can send us. We could ask them to do this in our invitation.]

### Aim for adopting new health IT

1. What health IT do you have in place? (List major health IT systems and tools they have)
  - a. When was each acquired?
  - b. What was the main purpose for each acquisition?
  - c. Did you formally document the purpose of acquiring the new technology before the acquisition? If so, did you use the documented purpose in the selection and evaluation process? If yes, how?\*

**Table 1**

#	Info Technology	Date	Purpose
1			
2			
3			

[Note – Indicate the row of the technology that will be used in later sections]

\* - Put this information in the Purpose section.

2. What health IT are you planning on acquiring?
  - a. What is the purpose of each?
  - b. Did you formally document the purpose of acquiring the new technology? If so, are you using the documented purpose in the selection and evaluation process (or will you be)? If yes, how?

**Table 2**

#	Info Technology	Date	Purpose
1			
2			

[The Date is the planned date of implementation.]

### Matching organizational systems to the IT system

1. Did you actively redesign your organizational systems before you acquired the new IT systems mentioned earlier?
  - a. If you did redesign work on your organizational systems before acquiring the new technology, how did you do it (approach, size of effort, scope, etc.)?

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2. To what extent did the new technology force change on your organizational systems (types of changes, areas, impact, tips for others, etc.)?

[Issue here is to see if the organization tried to optimize their systems before bring in new technology or did they simply impose new technology onto their existing systems. Change will invariably happen when new technology is brought in and what we want to find out here is to what extent the organization directed that change. One approach is to optimize the key systems of the organization (care teams, flow of the patient, etc.) and then look for new technology to improve on those newly redesigned systems. The opposite approach is to find new technology and plug it in and force the organizational systems to adjust to the new technology. Which was the major force for change?]

**Table 3**

#	Redesign or Health IT Driven	Tools and Methods	Changes
1			
2			
3			

### Technical Competencies

1. For the new technology you described in Table 1, what were the technical competencies that:
  - a. you already had
  - b. had to train for
  - c. had to hire in
  - d. had to contract for
  - e. Other?
2. How did you discover the need for each of the technical competencies?
3. How do you maintain the technical competencies?

#	Competency	Source?	Awareness?	Maintained?
1				
2				
3				
4				

### Resource allocation

1. What resources did you need in order to adopt the technology, including the following:
  - a. Total cost of acquisition, training, and roll-out \_\_\_\_\_
  - b. Percent time for already existing personnel \_\_\_\_\_
  - c. Additional personnel hired \_\_\_\_\_
  - d. New facilities needed or physical plan and/or design changes \_\_\_\_\_
  - e. Other resources \_\_\_\_\_

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### New Technology Evaluation

1. How did you choose the specific vendor and technology?  
\_\_\_\_\_
2. How long did the process take?  
\_\_\_\_\_
3. Who was involved in making the evaluation?  
\_\_\_\_\_
4. Who was involved in making the final decision?  
\_\_\_\_\_
5. What types of information and tools did you use to guide your evaluation and decisions?  
\_\_\_\_\_  
\_\_\_\_\_
6. What was most beneficial from your evaluation process?  
\_\_\_\_\_  
\_\_\_\_\_
7. What was missing from your evaluation process?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Strategy for Adoption –

1. What was your plan and timeline for testing and adoption of:
  - a. Technologies
  - b. Education and training systems
  - c. Acquisition of hardware, software, expertise, training, etc.
  - d. Other?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

[Note: Probe here for how they may have used PDSA cycles within each category of their plan; find out how they managed and learned as they were engaged in multiple parts of the plan; did they start simple, testing inexpensively before implementation, etc.]

8. Did you learn from others both before and during your testing and adoption (as outlined above)? If so, how did you do this, i.e., read, ask, observe, etc.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
9. What resources do you wish that you had had in planning for and adopting new technologies?

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### Reflections and Evaluation

1. How well do the new technologies interface with your pre-existing systems?

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Same question with systems outside your organization that are important for your operation?

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2. On a scale of 1 – 10 (with ten being the high rating) how would you rate the real functionality of the acquired systems versus your expectations based on sales information? What gaps if any exist?

Rating \_\_\_\_\_

Gaps: \_\_\_\_\_

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3. What IT knowledge is needed – not just for running the systems, but also for purchasing, training, configuration design and implementation, backup of data, people, hardware, etc. What do you know now that you wished you had known before acquiring the new technology?

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4. Were there any hidden and unforeseen costs (dollars, time, quality, satisfaction, upgrades, etc.) that you didn't anticipate?

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5. Was there any customization required of the new technology systems? How extensive? What kind? How was it accomplished?

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## Assessing and Synthesizing Existing Knowledge on Informatics in Primary Health Care

6. What were the top security issues with your new system? How did you make sure that security was taken care of?

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## References

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- <sup>2</sup> Available at <http://healthit.ahrq.gov>. Accessed May 5, 2007:
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